Item 5. Calibration – Tunnel Inflows

The role of Red Hill shaft as a mitigating containment measure in the event of a contaminant release depends on its ability to develop a capture zone encompassing the area impacted by a release. As a Hawaii-style supply, Red Hill shaft does not function as a simple vertical well: it gains water via seepage along the quasi-horizontal tunnel extending from the vertical shaft. One role of the groundwater models is to demonstrate the extent of capture (zone of contribution) of Red Hill shaft under a range of plausible conditions.

The interim groundwater flow model does represent Red Hill shaft as a linear quasi-horizontal feature rather than at a single vertical point. However, the simulated distribution of inflows to the eastern tunnel extension does not appear to match the documented inflow pattern encountered during tunnel construction (Inset Figure 5.1). During construction a clinker zone was encountered that contributed more than 60% of the flow to the tunnel whereas the interim model assumes uniform inflow along the tunnel. This difference highlights two issues: first, there is heterogeneity present on a scale of many tens to hundreds of feet that is not well understood nor represented in the interim model; second, that the extent of capture developed by the tunnel may be more head-dependent than represented in the current model. That is, the capture zone under high water level conditions may be dominated by seepage from this clinker at the end of the east tunnel, but under low water level conditions may be dominated by drawdown within the vertical shaft itself.

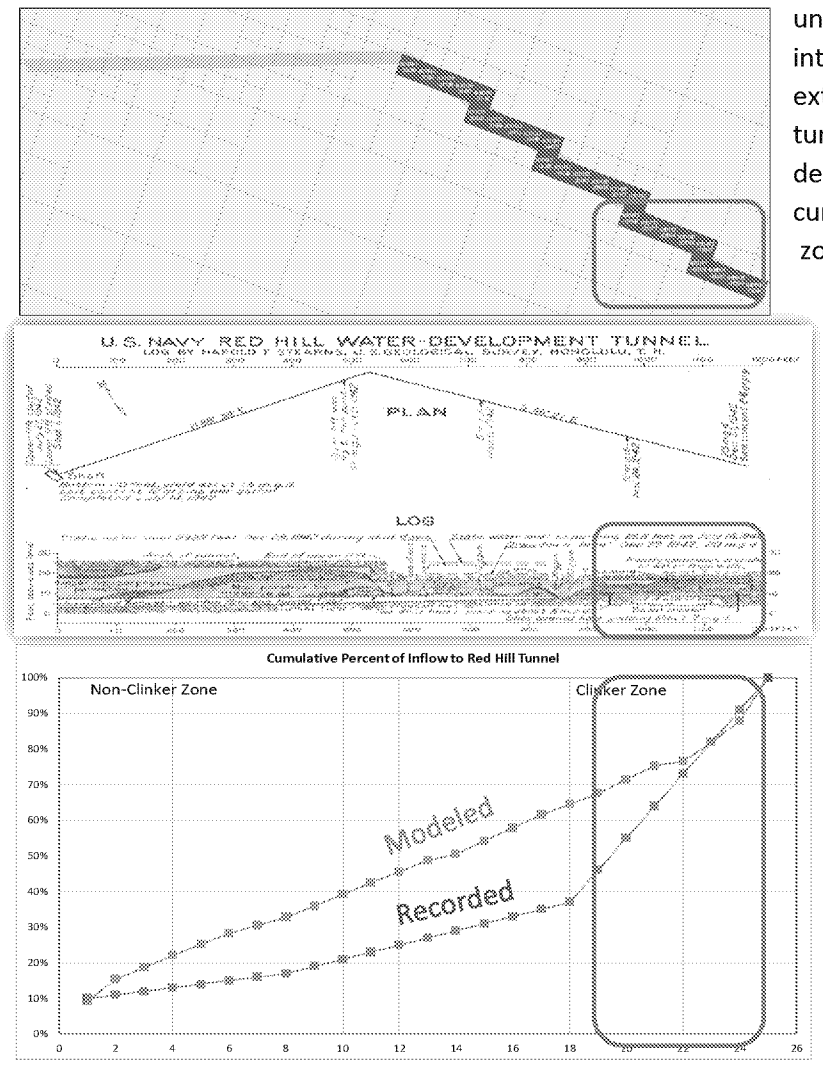

Figure 5.1 Schematic of Recorded and Simulated Inflows

The presence of large-scale heterogeneity is documented: however, their distribution and properties is not well known, and likely cannot be perfectly represented in models. Despite this, consideration must be given to the role they may play in the calibration of the groundwater model, and any inability to reasonably match heads and gradients; the zone of contribution to Red Hill shaft and tunnel system under different

conditions; and, the transport and fate of constituents in groundwater.

The final CSM and model should make a greater effort to evaluate the possible role of these heterogeneities – in particular, as an illustrative example, the Red Hill tunnel clinker – on calibration, zones of contribution, and contaminant transport. This may be accomplished for example by evaluating the zone of contribution under high water level conditions dominated by tunnel seepage, and under low water level conditions dominated by active pumping at the Red Hill shaft.